

remarks explaining various distinctions between the pending claims and Chou et al '499. The claims are thus believed presently to stand in allowable form.

Also, new claims 36-50 have been added.

Accordingly, please amend this application as shown herein. In view thereof, and the accompanying remarks, reconsideration of this application is respectfully requested.

IN THE SPECIFICATION

Please amend the Specification by replacing the paragraphs at the identified locations with the following new replacement paragraphs:

At page 5, lines 10-21:

FIG. 3 is a diagram of a PLC-based multiplexed control system 140, in which a single main central processing unit (CPU) 146 is used to monitor and control a number of network nodes 150 in a control network 145. Each network node 150 typically includes a programmable logic controller (PLC) which, in turn, monitors various input signals or conditions (such as temperature, current, speed, pressure and the like) and generates output signals to various output devices (such as actuators, relays or switches) through input/output (I/O) modules 152, thus providing localized control at various network node sites. The main control network CPU 146 communicates with the PLCs of each of the network nodes 150 over a main system bus 147, and provides top-level command and control. The main control network CPU 146 may be physically connected to a test computer 149 from time to time through an RS-232 compatible diagnostic and maintenance port 148, for the purpose of testing and monitoring the functionality of the control network 145 as previously described.

At page 6, lines 1-8:

FIG. 4 is a diagram of a network-controlled multiplexed control system 160 in which a network 165 of interconnected CPUs 170 are used to control a number of

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I/O modules 172. A main CPU 166 is connected to other dispersed CPUs 170 over a control area network (CAN) bus or device net 167. The CAN bus or device net 167 may be physically connected to a test computer 169 from time to time through a CAN bus or device net gateway 175, which connects to the CAN bus or device net 167 through a CAN bus or device net test port 168. Testing or monitoring of the functionality of the control network 165 may thus be carried out, as previously described.

At page 15, lines 3-12:

*G3*

In a preferred embodiment, a plurality of ground stations 710, each having an antenna 712, are dispersed in the microcells 762 so as to provide wireless communication capability therein. The ground stations 710, which are connected to a ground station interface 783 via landlines 751 and thereby to a local area network (LAN) 754, may be connected by landlines 713 in any suitable arrangement (e.g., serial chain, loop, or hub-and-spoke arrangements, to name a few). The ground stations 710 provide wireless communication with portable electronic diagnostic equipment 730 within the region covered by the microcells 762. The portable electronic diagnostic equipment 730 is preferably wireless in nature, as represented symbolically in FIG. 27 by the antenna 731 which is shown coupled to the portable electronic diagnostic equipment 730. The ground stations 710 may be located anywhere within the microcells 762, depending in part upon the type of antennas 712 selected. For example, a ground station 710 may be located at the center of a microcell 762 if it uses an omnidirectional antenna 712, or towards the edge of a microcell 762 if a directional antenna 712 is used.

At page 30, line 7 to page 31, line 2:

*G4*


FIG. 8 is a diagram of a similar control network system 260 wherein a handheld, computerized diagnostic device 261 (preferably embodied as a personal digital assistant (PDA)) communicates with a PLC-based control network 274 over a wireless communication link. PLC-based control networks have previously been

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described in general with respect to FIG. 3, and thus a main control network CPU 270, main system bus 271, network nodes 272, and input/output modules 275 all generally correspond to the similar elements depicted in FIG. 3. Similar to the control network system 240 shown in FIG. 7, in FIG. 8 the computerized diagnostic device 261 is connected to a wireless intermediary unit 263 (preferably embodied as an RF driver) which preferably has, among other things, an antenna 264 for facilitating wireless RF communication. The computerized diagnostic device 261 sends commands and other instructions in a digital format to the wireless intermediary unit 263, which re-formats (if necessary) and modulates the data over an RF communication link. A wireless diagnostic and maintenance linking device 267 (also preferably embodied as an RF driver) receives the modulated data from the wireless intermediary unit 263, demodulates the received data and places it in a format compatible with the control network 274. In the example of FIG. 8, the control network 274 includes an RS-232 compatible diagnostic and maintenance port 268, and thus the wireless diagnostic and maintenance linking device 267 would place the received information in a format compatible with the RS-232 protocol. However, any other type of interface between the wireless diagnostic and maintenance linking device 267 and the control network 274 may also be used.

At page 31, line 12 to page 32, line 8:

FIG. 9 is a diagram of another control network system 280 wherein a handheld, computerized diagnostic device 281 (preferably embodied as a personal digital assistant (PDA)) communicates with a CAN bus (or device net) based control network 294 over a wireless communication link. CAN bus based control networks have previously been described in general with respect to FIG. 4, and thus a main CPU 290, CAN bus or device net 291, CPUs 292, and I/O modules 295 all generally correspond to the similar elements depicted in FIG. 4. Similar to the control network systems 240 and 260 shown in FIGS. 7 and 8, respectively, in FIG. 9 the computerized diagnostic device 281 is connected to a wireless intermediary unit 283 (preferably embodied as an RF driver) which preferably has, among other things, an antenna 284 for facilitating wireless RF communication. The



computerized diagnostic device 281 sends commands and other instructions in a digital format to the wireless intermediary unit 283, which re-formats (if necessary) and modulates the data over an RF communication link. A wireless diagnostic and maintenance linking device 287 (also preferably embodied as an RF driver) receives the modulated data from the wireless intermediary unit 283, demodulates the received data and places it in a format compatible with the control network 294. In the example of FIG. 9, the control network 294 includes a CAN bus or device net compatible diagnostic and maintenance port 289 and a CAN bus or device net gateway 288, and thus the wireless diagnostic and maintenance linking device 287 would place the received information in a format compatible with the CAN bus or device net gateway 288. However, any other type of interface between the wireless diagnostic and maintenance linking device 287 and the control network 294 may also be used.

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At page 41, line 14 to page 42, line 8:

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FIG. 22 is a diagram of a preferred software system architecture as may be used in the computerized diagnostic device illustrated in FIG. 12. As illustrated in FIG. 22, the software system architecture 600 comprises a security checking function 605, a main menu function 601, and a security administration function 607, which preferably (but need not) collectively comprise a software loop as illustrated. The main menu function 601 calls any of a number of subsidiary functions, including a network information function 610, a help function 612, a power function 613, a logo function 614 and an RF test function 615. All of the foregoing functions 601, 605, 607, 610, 612, 613, 614 and 615 may be viewed as "network independent" in the sense that they do not depend upon the nature of the control network being tested or diagnosed. The network information function 610 in turn accesses a variety of additional subsidiary functions, including a system check function 620, an input check function 621, a force output function 622, and a real-time monitoring function 623. These latter functions 620, 621, 622 and 623 may be viewed as "network dependent" in certain aspects because they may depend or can be optimized for particular network configurations, types or implementations.



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A6*

Further details regarding the software functions appearing in FIG. 22 will be described or become apparent in the discussion of the test and diagnostic functions of the personal digital assistant 420.

At page 54, lines 6-12:

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In a preferred embodiment, a control module drop down menu 452 is available by selecting a drop down menu button 451, providing a list of all network nodes of the control network 218. The user may thereby select a particular network node for diagnostic testing. When a network node is selected, a network node output drop down menu 453 is displayed by selecting a drop down menu button 454, providing a list of all system outputs for the selected network node. The user may then scroll through the list and select a particular system output to be tested using the real time monitoring function.

IN THE CLAIMS

Please cancel claim 34 without acquiescence in the grounds of rejection, and without prejudice to pursue at a later time by continuation application or otherwise.

Please replace pending claims 1, 6, 7, 9, 11, 16-21, 25-33, and 35 with the following amended claims:

*A8 SB  
B1*

1. (Amended) A system for facilitating diagnosis and maintenance of electronic control networks, comprising:

a wireless diagnostic device adapted for manual transport, said wireless diagnostic device comprising a transmitter and receiver for communicating over a wireless communication channel with a control network to be monitored, diagnosed, or tested; and

at least one wireless ground station, said at least one wireless ground station comprising a ground station receiver attuned to said wireless communication channel, whereby transmitted messages between said wireless diagnostic device and the control network over said wireless communication channel are monitored.